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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

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Improvements in SMS messaging

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"Improvements in SMS messaging"

Introduction

The invention relates to Short Message Services (SMS), both for person-to-person messaging and two-way SMS services across different wireless technologies (e.g. GSM, ANSI-136/TDMA, IS-95/CDMA).

At present, many network operators can only offer SMS services to users who access a mobile network using the same technology as the network operator. SMS Services includes both person-to-person messaging, application server-to-person messaging and person-to-application server messaging; that is there is always a mobile device involved. For example, a CDMA operator can only offer SMS services to his own subscribers or subscribers of other CDMA network operators. The CDMA operator cannot offer these services to subscribers of GSM networks.

Some solutions exist today which allow an operator to offer "inter-technology" person-to-person messaging with inter-operator message transfer over IP links using proprietary protocols. No such solution exists today for inter-technology message transfer over SS7 links for the GSM, UMTS, TMDA and CDMA technologies.

The invention addresses this problem.

Statements of Invention

According to the invention, there is provided a virtual mobile node comprising means for transferring an SMS message between an entity in a foreign mobile network that deploys a different wireless technology to an SMS entity (SME) connected to the local network. The local SME may be a mobile handset belonging

to a subscriber, but it could be also another entity such as an Information Application Server).

The virtual mobile node comprises means for transferring the SMS to and from the foreign network using the SS7 based SMS transfer protocols standardised for the wireless technology deployed by the foreign network. The virtual mobile node achieves this by emulating itself as "foreign technology" mobile station receiving messages from a foreign SMSC. A pre-condition is that the recipient SMS entity (i.e. the mobile station) is addressed using its national or international directory number.

In one embodiment, the node comprises a pseudo HLR.

In another embodiment, the node comprises a pseudo MSC.

In another embodiment, the node comprises an SMSC routing and forwarding engine.

According to another aspect, the invention provides a method for processing an SMS request for a service in which the request is made by a user in a foreign mobile network and includes a mobile number associated with the service, the method comprising the steps of:

the foreign SMSC receiving the request,

the foreign SMSC routing the request to a virtual mobile node, and

the virtual mobile node routing the request to an application server.

In one embodiment, the virtual mobile node acts as a pseudo HLR.

In another embodiment, the virtual mobile node acts as a pseudo MSC.

In another embodiment, the node comprises a SMSC routing and forwarding engine.

Detailed Description of the Invention

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only with reference to the accompanying drawings in which:-

Figs. 1 and 2 are flow diagrams illustrating inter-technology message transfer between networks (deploying different wireless technologies) for SMS services;

Fig. 3 is a diagram illustrating deployment of a virtual mobile node; and

Fig. 4 is a signal transfer diagram.

Referring to Fig. 1, a virtual mobile node (VN), deployed in CDMA Operator A' network, receives an SMS message from an SMSC B of a GSM network over SS7 protocols. The message is destined to a person who is a subscriber of CDMA operator A and is thus equipped with a CDMA mobile station.

The VM node forwards the message to the Operator A's SMSC over the internal IP network. In the example the VM node is using SMPP to transfer the message via the Message Application Router (MAR) as an intermediary gateway. This procedure allows CDMA Network Operator A to offer an SMS service where his subscribers can receive messages from other mobile users equipped with "different technology" handsets. The interconnect to the foreign network is SS7 based.

The reverse direction is shown in Fig. 2. In this case, the operators own subscriber sends an SMS message to a GSM user of network B. The message can be sent either autonomously or as reply to a received message from the GSM user. Subscriber A originates the message as normal thus causing the SMS to be stored in his home SMSC A. SMSC A determines that the destination address is not a CDMA mobile and forwards the SMS to an SMSC Interworking Gateway (MAR) over an IP or X.25 based protocol (e.g. UCP, SMPP). The SMSC Interworking Gateway forwards the message to the VM node which is acting in the mode of an SMSC. The VM node determines that the destination is a GSM mobile and delivers the message over SS7 using GSM MAP and GSM 03.40 protocols to GSM user B.

The deployment is shown in Fig. 3.

In more detail, the procedures involved for message transfer from a GSM network to a hosting TDMA, CDMA or PDC network are:

1. Querying a pseudo GSM HLR to determine the serving MSC and the IMSI
2. Sending the message to the pseudo GSM MSC 24, using the address information form action 1 to address GSM pseudo MSC 24
3. Routing and Sending the message over an SMSC access protocol (e.g. SMPP) for transfer to the home SMSC.

The node 22 acts as a pseudo GSM HLR, that will return the recipient (virtual) mobile number in the IMSI and optionally the serving MSC Address parameter in the response signal (SRI-SM response). The node 22 acts as a pseudo GSM MSC to accept the mobile terminated short message and, retrieving the original (virtual) mobile number digits from the IMSI and Serving MSC Address parameters. The node 22 acts an SMSC and forwards the message to the SMSC Interworking Gateway 21 for transfer to the home SMSC.

The node accepts a Short Message being delivered by another GSM SMSC. This requires the following:

- Support for GSM MAP Forward Short Message (GSM) operation in mobile terminated
- Support for reception of GSM 03.40 SMS-DELIVER Transfer Layer PDU
- Modified parameter and error handling (Assumption: only limited range of error causes has to be supported, e.g. paging failure would never occur).
- Appropriate message validation, address translation and onward routing

As shown in Fig. 4, the Virtual Mobile Node 22 interfaces with an SMSC 20 and an interworking gateway 21. It emulates a GSM MSC and a GSM HLR using pseudo HLR 23 and a pseudo MSC 24. It terminates the message delivery from a foreign GSM SMSC and forwards it to the SMSC Interworking Gateway 21.

The following are the signals:-

1a) MO Short Message (GSM 03.40) from MS user to foreign SMSC. Message is addressed to MSISDN assigned to recipient.

1b) Internal SMSC request to deliver the SMS message.

2) MAP_SEND_ROUTING_INFO_FOR_SM (msisdn = "recipient MSISDN")

3) MAP_SEND_ROUTING_INFO_FOR_SM_ACK. The location information (network_number) is the GT network address of the Virtual Mobile Node. A virtual IMSI is also returned – it's digits are a function of the original MSISDN.

4) MAP_MT_FORWARD_SHORT_MESSAGE. IMSI and network address are included.

5) MAP_MT_FORWARD_SHORT_MESSAGE_ACK

6) void

7) Delivery to SMSC Interworking Gateway (e.g. SMPP SM_DELIVER)

8) Delivery Acknowledgement from SMSC Interworking Gateway(e.g. SMPP SM_DELIVER_resp)

9) In case of delivery failure at step 7 due to a temporary condition, a subsequent retry of Delivery to SMSC Interworking Gateway (e.g. SMPP SM_DELIVER).

10) Delivery Acknowledgement from SMSC Interworking Gateway (e.g. SMPP SM_DELIVER_resp)

Routing Information Enquiry

In some cases, such as Service Providers or MVNOs, own network (HLR) is not available, thus mandating a pseudo GSM HLR functionality within the Virtual Mobile.

- SendRoutingInfoForSM requests may be received by the Virtual Mobile (using HLR SSN correspondingly Number).
- Support for v1, v2 and v3 of SRI-SM.
- A response is returned by the Virtual Mobile, with a pre-defined MSC number and IMSI or LMSI generated according to the MSISDN (an appropriate algorithm is provisioned on the Virtual Mobile Node).
- A limited range of errors is supported:
- Unidentified subscriber
- System failure
- Unexpected data value

- Data Missing

SMS Forwarding

- Mobile Terminated Forward Short Message is received by the Virtual Mobile (using MSC correspondingly Number.
- Reconstruction of the original destination number from the IMSI and (if necessary) the MSC address parameters.
- Virtual Mobile will decode the MT-FSM payload as SMS-DELIVER PDU rather than SMS-SUBMIT PDU
- In a manner identical to SMSC message validation, address translation and message routing can be performed
- Support for v1, v2 and v3 of MT-FSM.
- A limited range of errors is supported:
- Unidentified subscriber
- System failure
- Unexpected data value
- Data Missing
- Illegal Subscriber
- Facility Not Supported
- SM Delivery Failure
- SMS message is routed using the destination number over SMPP (or other proprietary SMSC access protocol) to the SMSC Interworking Gateway which forwards it to the home SMSC. The home SMSC uses standard ANSI-41 procedures (in the case of TDMA and CDMA networks) or ISUP

procedures (in the case of PDC networks) to deliver the message to the recipient mobile.

In more detail, the procedures involved for message transfer from a TDMA or CDMA network to a hosting GSM, TDMA, CDMA or PDC network are:

1. Querying a pseudo ANSI-41 HLR to determine the serving MSC and the MIN (in the case of MIN been different from directory number)
2. Sending the message to the pseudo ANSI-14 MSC 24, using the address information form action 1 to address pseudo ANSI-41 MSC 24
3. Routing and Sending the message over an SMSC access protocol (e.g. SMPP) for transfer to the home SMSC.

The node 22 acts as a pseudo ANSI-41 HLR, that will return the recipient (virtual) mobile number in the MIN and optionally the serving MSC Address parameter in the response signal (SMSREQ response). The node 22 acts as a pseudo ANSI-41 MSC to accept the mobile terminated short message and, retrieving the original (virtual) mobile number digits from the MIN and Serving MSC Address parameters. The node 22 acts an SMSC and forwards the message to the SMSC Interworking Gateway 21 for transfer to the home SMSC.

The Node accepts a Short Message being delivered by another ANSI-41 SMSC. This requires the following:

- Support for ANSI-41 Short Message Delivery Peer-to-Peer (SMDPP) MAP operation in mobile terminated direction
- Support for reception of TDMA (IS-136) and CDMA (IS-637) SMS-DELIVER Teleservice Layer PDU

- Modified parameter and error handling (Assumption: only limited range of error causes has to be supported, e.g. paging failure would never occur).
- Appropriate message validation, address translation and onward routing

As shown in Fig. 4, the Virtual Mobile Node 22 emulates an ANSI-41 MSC and an ANSI-41 HLR, terminates the message delivery from a foreign ANSI-41 SMSC and forwards it to the SMSC Interworking Gateway 21.

The following are the signals:-

1a) MO Short Message (SMS-SUBMIT) from CDMA/TDMA MS user to foreign SMSC. Message is addressed to mobile directory number (MDN or MSISDN) assigned to recipient.

1b) Internal SMSC request to deliver the SMS message.

2) SMSREQ INVOKE (mdn = "destination directory number")

3) SMSREQ RETURN RESULT. The location information (SMS Address) is the SS7 network address of the Virtual Mobile Node. An MIN number is also returned – it's digits are a function of the original directory number.

4) SMDPP Invoke. MIN and MSC network address are included.

5) SMDPP RETURN RESULT.

6) void

7) Delivery to SMSC Interworking Gateway (e.g. SMPP SM_DELIVER)

8) Delivery Acknowledgement from SMSC Interworking Gateway (e.g. SMPP SM_DELIVER_resp)

9) In case of delivery failure at step 7 due to a temporary condition, a subsequent retry of Delivery to SMSC Interworking Gateway (e.g. SMPP SM_DELIVER).

10) Delivery Acknowledgement from SMSC Interworking Gateway (e.g. SMPP SM_DELIVER_resp)

Routing Information Enquiry

In some cases, such as Service Providers or MVNOs, own network (HLR) is not available, thus mandating a pseudo ANSI-41 HLR functionality within the Virtual Mobile Node.

- SMSREQ requests may be received by the Virtual Mobile (using HLR SSN correspondingly Number).
- Support for Rev C, D and E of ANSI-41 SMSREQ.
- A response is returned by the Virtual Mobile, with a pre-defined MSC number and MIN generated according to the directory number (an appropriate algorithm is provisioned on the Virtual Mobile Node).
- A limited range of errors is supported:
  - "Invalid"
  - "Denied"

SMS Forwarding

- Mobile Terminated SMDPP is received by the Virtual Mobile (using MSC correspondingly Number).
- Reconstruction of the original destination number from the MIN and (if necessary) the MSC address parameters.
- Virtual Mobile will decode the SMDPP payload (bearer data) as SMS-DELIVER PDU rather than SMS-SUBMIT PDU

- In a manner identical to SMSC message validation, address translation and message routing can be performed
- Support for Rev C, D and E of SMDPP.
- A limited range of errors (SMS Cause Codes) are supported:
  - "Address Vacant"
  - "Address translation failure"
  - "Network Resource Shortage"
  - "Network Failure"
  - "Invalid Teleservice Id"
  - "Destination out of Service"
  - "Encoding Problem"
  - "SMS Termination Denied"
  - "Missing Expected Parameter"
  - "Missing Mandatory Parameter"
  - "Unrecognised Parameter Value"
  - "Unexpected Parameter Value"
  - "User Data Size Error"

- SMS message is routed using the destination number over SMPP (or other proprietary SMSC access protocol) to the SMSC Interworking Gateway which forwards it to the home SMSC. The home SMSC uses standard ANSI-41 procedures (in the case of different TDMA or CDMA network) or GSM MAP procedures (in case of GSM network) or ISUP procedures (in the case of PDC networks) to deliver the message to the recipient mobile.

In summary, the invention provides the following features and advantages.

A method for a TDMA operator to receive an SMS from a foreign GSM network and forwarding it to an SMSC for delivery to a local TDMA subscriber.

A method for a TDMA operator to receive an SMS from a foreign CDMA network and forwarding it to an SMSC for delivery to a local TDMA subscriber.

A method for a CDMA operator to receive an SMS from a foreign GSM network and forwarding it to an SMSC for delivery to a local CDMA subscriber.

A method for a CDMA operator to receive an SMS from a foreign TDMA network and forwarding it to an SMSC for delivery to a local CDMA subscriber.

A method for a GSM operator to receive an SMS from a foreign TDMA network and forwarding it to an SMSC for delivery to a local GSM subscriber.

A method for a GSM operator to receive an SMS from a foreign CDMA network and forwarding it to an SMSC for delivery to a local GSM subscriber.

A computer based method for receiving an SMS from a foreign SMSC as a mobile terminated delivery; examining the destination number and forwarding it over an IP based SMSC access protocol to an adjacent node in the operators network. The adjacent node can be an SMSC, or an SMSC Interworking Gateway or an SMS Application Server.

The invention is not limited to the embodiments described but may be varied in construction and detail.

Claims

1. A virtual mobile node comprising means for transferring an SMS message between an entity in a foreign mobile network that deploys a different wireless technology to an SMS entity (SME) connected to the local network.

2. A virtual mobile node as claimed in claim 1, wherein the node comprises a pseudo HLR.

3. A virtual mobile node as claimed in claim 1 or 2, wherein the node comprises a pseudo MSC.

4. A virtual mobile node as claimed in claim 1 or 2, wherein the node comprises an SMSC routing and forwarding engine.

5. A method for processing an SMS request for a service in which the request is made by a user in a foreign mobile network and includes a mobile number associated with the service, the method comprising the steps of:

the foreign SMSC receiving the request,

the foreign SMSC routing the request to a virtual mobile node, and

the virtual mobile node routing the request to an application server.

ABSTRACT

"Improvements in SMS messaging"

(Fig. 4)

A virtual mobile node (22) has a pseudo HLR (23) and a pseudo MSC (24). It transfers an SMS message between an entity in a foreign mobile network having a different technology to an SMS entity connected to the local network.

Virtual Mobile Solution
Message received from GSM sub

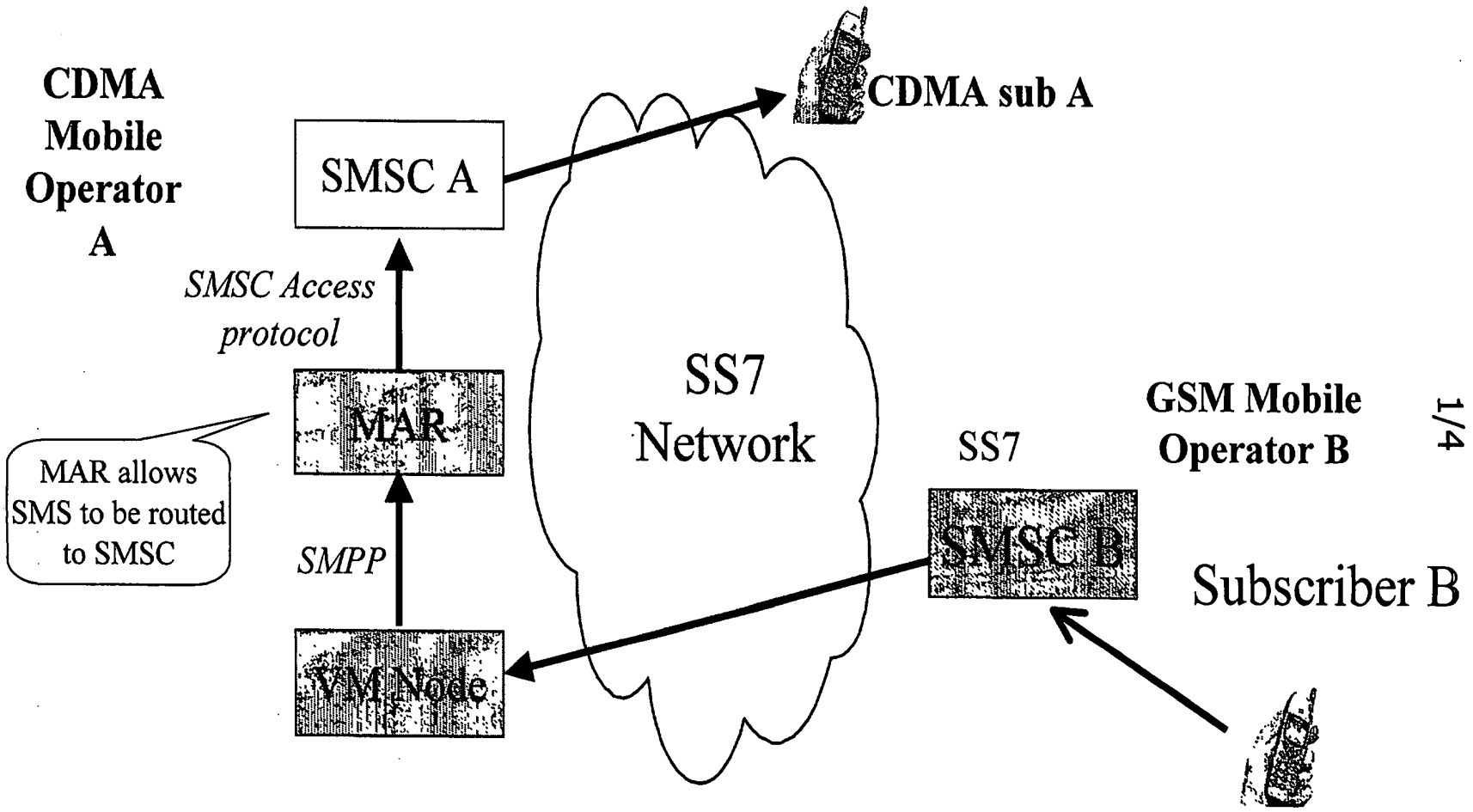


Fig. 1

The Virtual Mobile Node allows messages from a GSM subscriber to be forwarded to the CMDA Operators SMSC

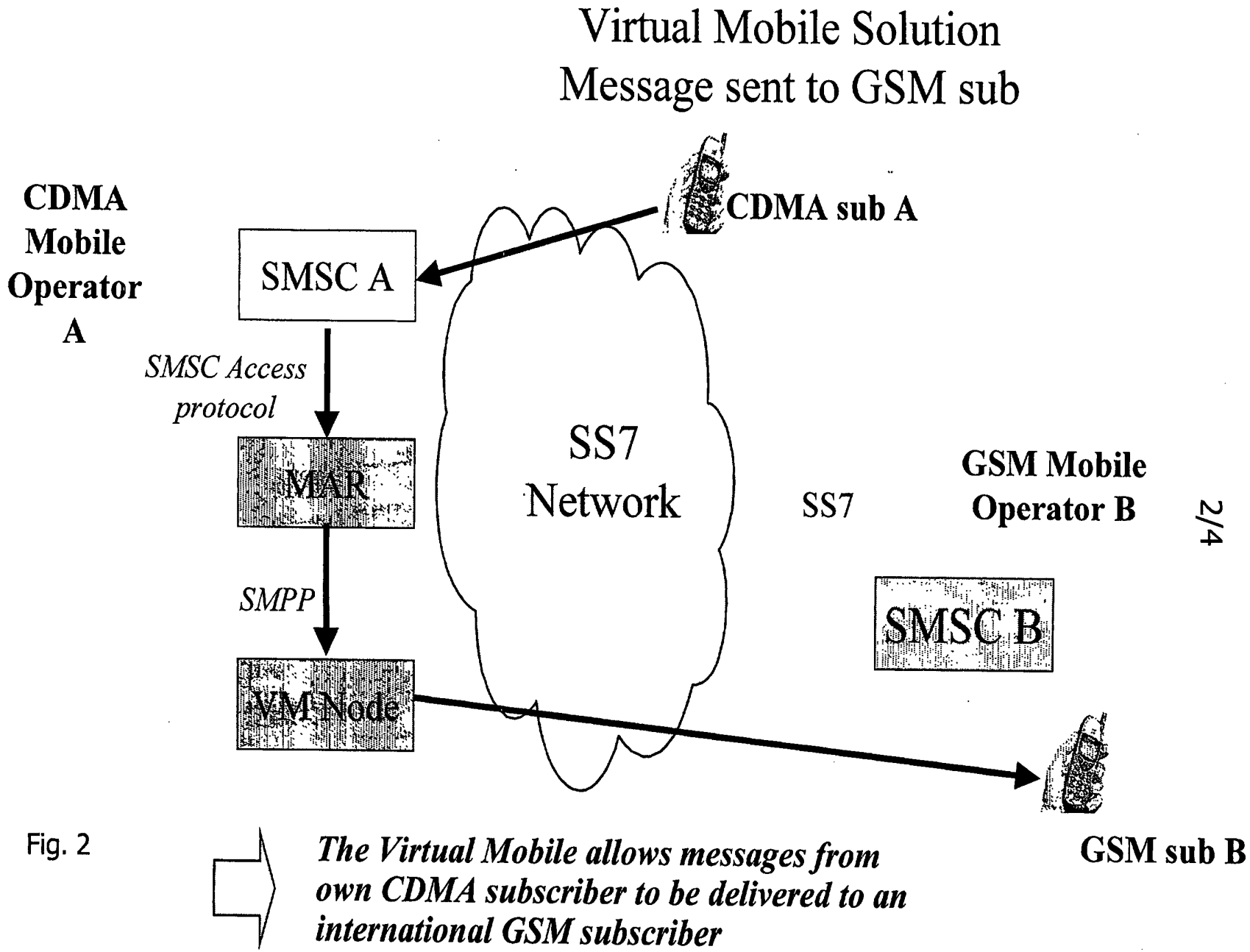
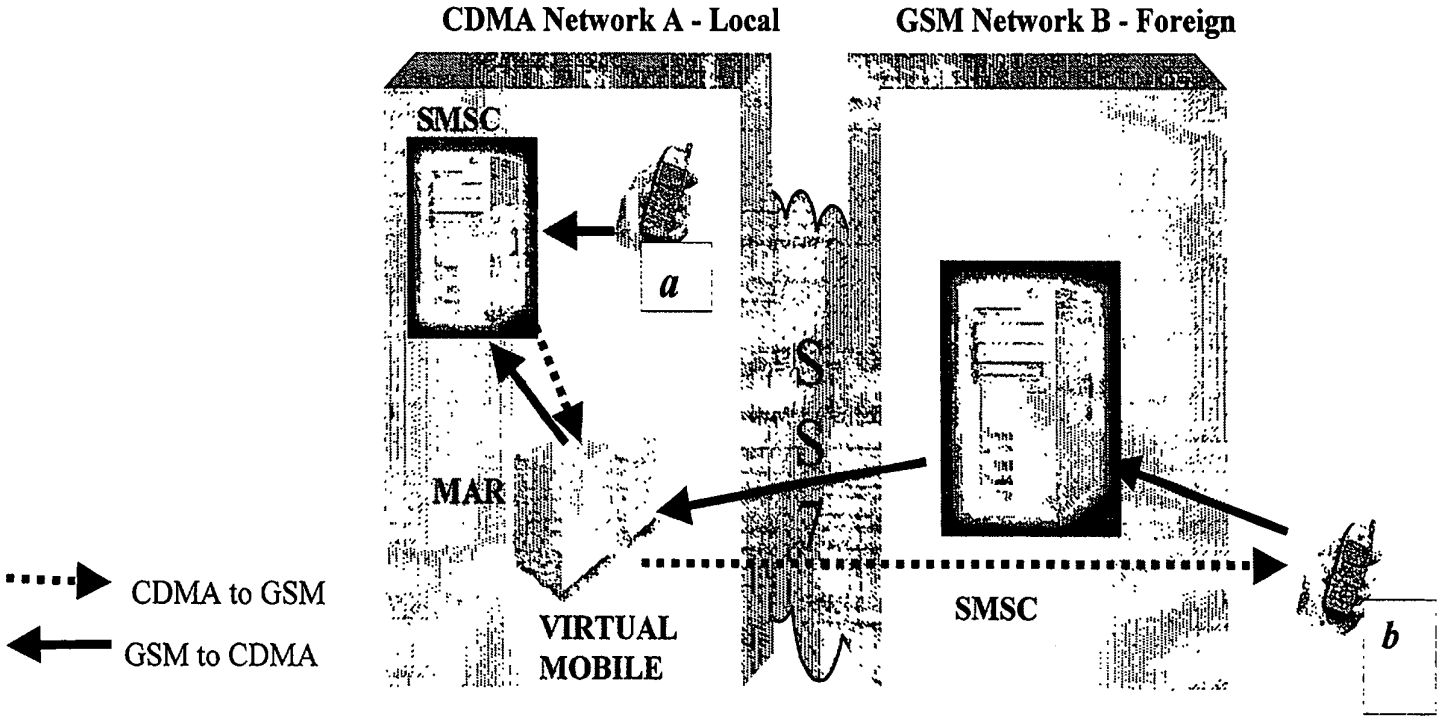


Fig. 2

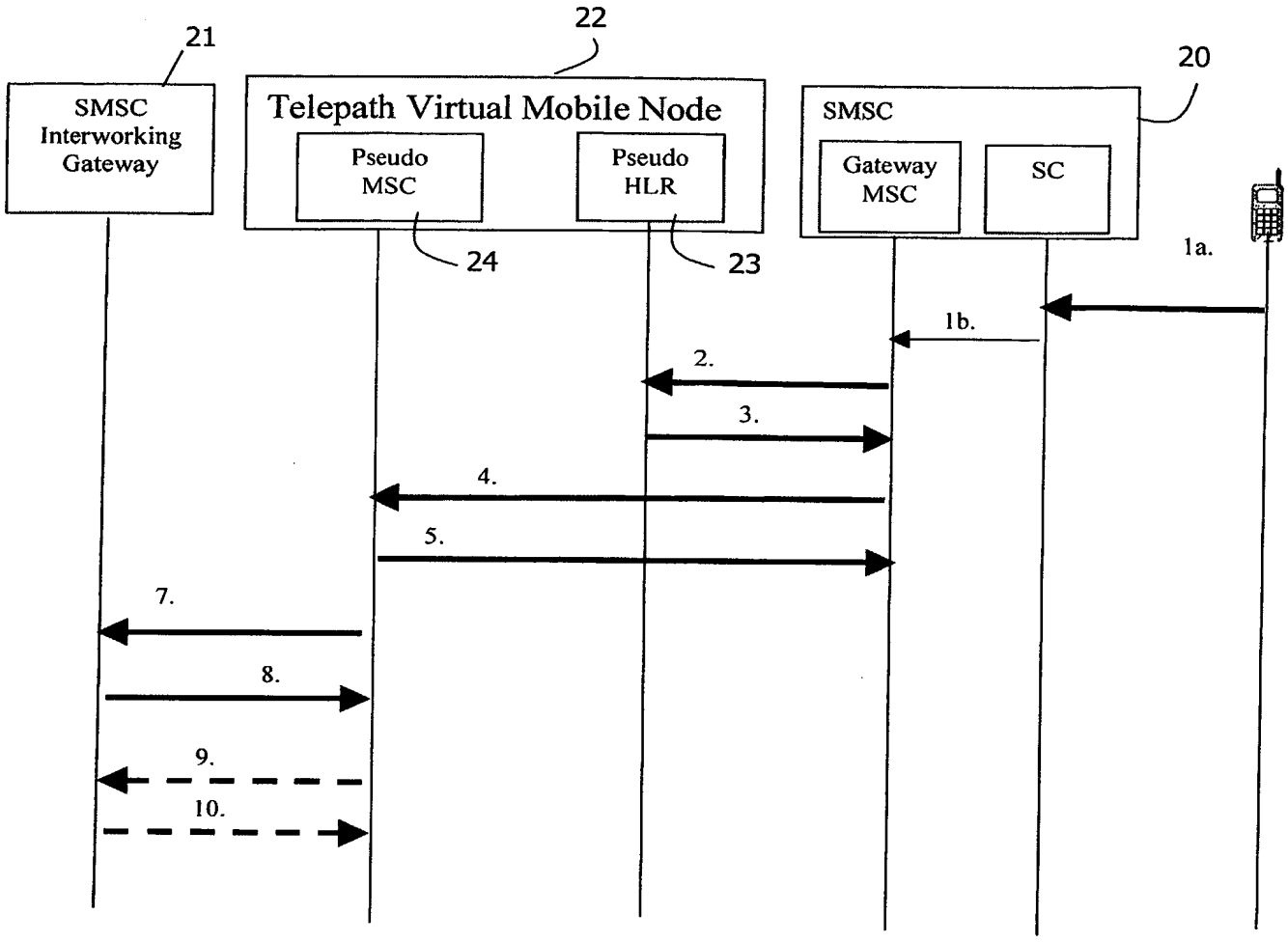
The Virtual Mobile allows messages from own CDMA subscriber to be delivered to an international GSM subscriber

Network Deployment



- Virtual Mobile presents a GSM HLR and MSC function in Operator's A network to GSM Network B
- Virtual Mobile provides a GSM Gateway MSC function for MT SMS to International GSM users

Fig. 3


21
22
20
SMSC
Interworking
Gateway
Telepath Virtual Mobile Node
Pseudo
MSC
Pseudo
HLR
SMSC
Gateway
MSC
SC
24
23
1a.
1b.
2.
3.
4.
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7.
8.
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10.

Fig. 4